

CLAIMS

What is claimed is:

1. A disc having grooves and pits with different depths, the grooves with record marks for information recording, the disc comprising:

a first land having land pre-pits for address signals, the land pre-pits spaced a predetermined distance apart along a track direction of the disc; and

a second land having the pits for reproduction-only,

wherein the disc satisfies the conditions:

$$\lambda / 8n \leq d_3 \leq \lambda / 5n$$

where d_3 is a difference in depths between the grooves and the pits, λ is a wavelength of a light source to access the disc, and n is the refractive index of the disc.

2. The disc of claim 1, wherein the grooves and the pits lie on the same base line, and the depth of the grooves is different to that of the pits.

3. The disc of claim 2, wherein the grooves have a depth at which a push-pull signal before recording (PPb) ranges from 0.22 to 0.44.

4. The disc of claim 1, wherein the grooves have a depth at which a push-pull signal before recording (PPb) ranges from 0.22 to 0.44.

5. A method of manufacturing a disc having grooves and pits with different depths, the method comprising:

depositing photoresist over a glass master to have a thickness which is the same as the depth of the pits of the disc to be manufactured;

cutting a first portion of the photoresist with a laser beam having a first power level to a depth d_1 to form a first land region, cutting a second portion of the photoresist with a laser beam having a second power level higher than the first power level to a depth d_2 to form a second land region, and developing the photoresist which has undergone the cutting of laser, thereby completing a master;

stamping a father stamper having a groove region and a pit region from the master, the groove region and the pit region of the father stamper being inverse to those of the master;

stamping a mother stamper from the father stamper, a shape of the mother stamper being inverse to a shape of the father stamper; and

injection molding the disc from the mother stamper, the disc having the grooves and the pits corresponding to the groove region and the pit region of the mother stamper, respectively, wherein the depth d_1 of each of the grooves and the depth d_2 of each of the pits of the disc are different.

6. The method of claim 5, wherein the grooves and the pits lie on the same base line, and the depth of the grooves is different to that of the pits.

7. The method of claim 6, wherein the grooves have a depth at which a push-pull signal before recording (PPb) ranges from 0.22 to 0.44.

8. The method of claim 5, further comprising turning the laser beam having the first power level off when cutting the first land region to form a land pre-pit region of the master which is to be used to form a land pre-pit in the disc.

9. The method of claim 5, wherein the grooves have a depth at which a push-pull signal before recording (PPb) ranges from 0.22 to 0.44.

10. A disc, comprising:
grooves with record marks to record information;
a first land having land pre-pits for address signals, the land pre-pits spaced a predetermined distance apart along a track direction of the disc; and
a second land having reproduction-only pits,
wherein the disc satisfies the condition:

$$(\text{MaxPD} - \text{MinGD}) \leq d_3 \leq (\text{MaxPD} - \text{MaxGD})$$

where d_3 is a difference in depths between the grooves and the pits, MaxPD indicates a pit depth at which a pit signal has a maximum level, MinGD indicates a minimum groove depth under a disc specification for the disc and MaxGD indicates a maximum groove depth under the disc specification.

11. The disc according to claim 10, wherein the grooves and the pits both lie on a same base line and the grooves and the pits have different depths d_1 and d_2 , respectively.

12. The disc according to claim 10, wherein tops of the first land and the pits both lie on a same line and the grooves and the pits have different depths d_1 and d_2 , respectively.

13. A disc manufacturing method, comprising:
depositing photoresist over a glass master to have a thickness same as depth of pits of the disc to be manufactured;

cutting the photoresist using a laser beam having a first power level to form a first land region and cutting the photoresist using a laser beam having a second power level higher than the first power level to form a second land region, depth of the second land region being same as the thickness of the photoresist; and

stamping from the master a disc having grooves and pits corresponding to the first land region and the second land region, respectively, the grooves and the pits lying on a same base line and having different depths.

14. The method of claim 13, wherein tracks on the master are formed in opposite direction to spiral direction of the disc with a laser beam, and the method further comprising:

stamping a father stamper having grooves and pits from the master, the grooves and the pits of the father stamper formed by the first land region and the second land region of the master, respectively, by being inverse of the first land region and the second land region of the master;

stamping a mother stamper having grooves and pits from the father stamper, the grooves and the pits of the mother stamper being inverse to those of the father stamper; and

injection molding the disc from the mother stamper, the disc having grooves and pits corresponding to the grooves and the pits of the mother stamper, respectively.

15. The method of claim 13, further comprising:

wobbling the first land region of the master and wobbling land regions of the father and the mother stampers, the land regions of the father and the mother stampers corresponding to the first land region of the master; and

wobbling the grooves of the father and mother stampers to have substantially the same phase as the land regions of the master, the father and the mother stampers.

16. A method of manufacturing discs, comprising:

depositing a photoresist over a glass master to have a thickness same as a depth of pits of the discs to be manufactured;

cutting the photoresist to form a master using laser beams with different power levels to form grooves and the pits, the grooves and the pits having different depths;

stamping from the master a father stamper having grooves and pits, the grooves and the pits of the father stamper being inverse to those of the master;

stamping mother stampers from the father stamper, the mother stampers being the same shape as the master; and

stamping discs having grooves and pits with different depths and lying on same baseline from the mother stampers.

17. A method of manufacturing discs, comprising:

depositing a photoresist over a glass master to have a thickness same as a depth of pits of a disc;

cutting the photoresist to form a master using laser beams with different power levels to form grooves and the pits, the grooves and the pits having different depths; and

forming the discs with an even-number stamper from the master.

18. A method of forming a master to produce a disc, comprising:

depositing photoresist over a glass master to have thickness same as depth of pits of a disc stamped from the master; and

cutting the photoresist using a laser beam having a first power level to form a first land region and cutting the photoresist using a laser beam having a second power level higher than the first power level to form a second land region, depth of the second land region being same as the thickness of the photoresist, to form the master.